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R/3 IMPLEMENTATION ANALYSIS
IN VARIOUS INDUSTRIES

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Business Administration:
Information Assurance and
Security Management

by
Paul Alan Rascoe

June 2007

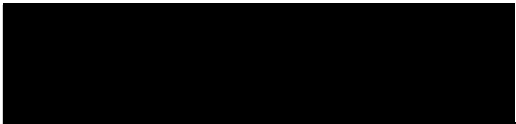
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Approved by:




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ABSTRACT

This project's aim is to analyze six companies in various industries that are currently implementing or using Systems, Applications and, Products in data processing (SAP)'s R/3. It outlines the history of SAP and gives background on the companies including what they used before R/3, why they chose R/3, and some challenges involved with changing over the R/3. A comparison of the companies is done along with analysis on the strategic motivators behind the change to R/3. These motivators are grouped in 3 categories, Operational advantages, Relationship advantages, and Market advantages. From here better insight is found on what the chosen companies were trying to achieve through implementation of R/3. Lastly the conclusion addresses the common challenges faced with R/3 implementation and discusses in what case each company can be used as a model during implementation of R/3.

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CHAPTER ONE

INTRODUCTION

ERP systems are large comprehensive programs that are used to improve a company in many ways. In this paper implementation of SAP's R/3 in multiple organizations will be examined. R/3 differs from its main competition by being completely integrated and not using purchased interfaces. R/3 is a suite of modules which is comprised of a core and then additional industry dependent modules. With this modular design R/3 is very versatile and can fit almost any industry. However because of the core being standard the processes it can do are standardized from implementation to implementation. These processes can be customized to fit the processes in place at an organization and it is because of this customization that takes place that every implementation of R/3 is unique, and requires experienced support people to maintain the implementation. If two companies implemented R/3 at the same time with the same modules it would only be the same implementation for a short time. It is necessary to customize the implementation to meet market needs and strategic objectives of the company. It is this evolution of the

implementation that occurs as the company adjusts to it's ever changing environment, that makes the two implementations even less similar. It is not uncommon for R/3 consultants to take months if not years to completely understand and know the customization that has been done on a R/3 implementation.

Background

Systems, Applications, and Products in Data Processing was formed in 1972 in Manheim Germany by 5 former IBM employees. They noticed a trend of IBM customers, all of whom were developing software that was very similar. With growing concerns over the complexity of software development they found an opportunity. The software the customers were developing was being used to track the financials of the companies developing the software. These founders decided to create a standardized piece of software that would do financial tracking in real-time. In 1973 the R/1 system was released with the R standing for Real-Time. The program was a success and by the end of the decade a further enhanced version, R/2 was released. R/2 featured enhancements that allowed international companies to have all of their offices use the same data. It worked in

multiple languages as well as with different currencies. It was also created with a modular design in mind. This modular design allowed for increased reuse of code and better customization for different industries. SAP also included the "Best Practices" for processes for different standardized industrial processes as well as the necessary internal transactions that occur with these processes. These changes changed SAPs' target market segment to the large, multinational companies that could afford the hardware necessary to run the R/2 system as well as required the multi-lingual and multi currency, "Best Practices" included with R/2. With R/2 running on a mainframe/terminal system, many smaller companies could not afford to run the R/2 system. This changed with the 1990's release of R/3.

R/3 was built upon the international base of R/2 but changed to a three-tier network system. The data set was placed on a database server, the R/3 application on an application server that would be accessed by the third layer the client's workstations. R/3 was also designed to run on almost any operating system and/or server manufacturer (Apple, OSX, Solaris, Windows Etc). This set-up combined with the ever-decreasing cost of technology

allowed for companies of much smaller size to take advantage of the advantages of SAP's R/3 as well as the disadvantages. SAP also introduced the object-orientated concept with regards to the database used. This was a key to the inclusion of the "Best Practices" included in the R/3 system because all the objects (Transactions) worked in pre-defined yet customizable ways.

SAP has used a modular design in its systems with a set of core functions that almost all organizations would use as well as other industry specific modules. This allowed for complete customization of implementations to meet the specific demands of a customer regardless of the customers size or industry. The core modules are Financials and Control, Human Resources, Materials Management, Sales and Distribution. Each was designed to work alone as well as linked together with the other modules when installed. Another unique and valuable module would be the CRM (Customer Relationship Manager) which allows the sales team to view a sales history of an account as well as the contact information and notes on the customer.

By using a 3-tiered system model the dataset was secured through only allowing access through the R/3

systems application software. In developing this application software SAP developed a unique programming language, ABAP which stands for Advanced Business Application Programming. This custom language allowed for increased stability of the program as well as the enhanced security of the information stored in the database. The R/3 application used Open Source SQL statements for the access to the database, which allowed for an almost endless ability to customize the R/3 implementation to get all the desired information from the database.

Section Details

In the following sections I will be reviewing and discussing how R/3 has been used in various industries. I will use first hand experience as well as data gathered through interviews with professionals using R/3 in the various industries.

Section one will cover the pharmaceutical industry. Allergan Pharmaceuticals is the company that will be reviewed and information from the IT managers as well as information on the SAP implementation will be presented.

Section two will cover the advertising industry. For this section I will review how Pacific Communications

utilizes SAP for daily operations and how it has been customized to fit their needs. This will include information from the companies CFO as well as CIO.

Section three will be on a scientific manufacturing industry. Varian Inc, specifically their consumables division will be reviewed. Information will be presented from first hand experience as well as from the IT manager responsible for maintaining the R/3 system and running the daily and weekly reports.

Section four will be on the defense contract industry. Focus will be on Northrop-Grumman who is currently in the process of implementing R/3. For Northrop-Grumman particular attention will be placed on analysis of previous software and on the decision to move to R/3. The information is being collected from the Project manager responsible for the implementation at a San Diego Facility.

Section five will be on an energy company. Sempra energy will be the company reviewed. In this section attention will be paid to how an energy company can utilize R/3 which is heavily favored in a Manufacturing type environment compared to a service environment.

Section six will cover the aerospace industry by analyzing how Goodrich has implemented R/3 as an upgrade.

For Goodrich information will be gathered from local IT people as well as users.

Chapter three will be a summary of the other chapters. It will outline similarities in usages of R/3 in different industries. It will also show how customized and different R/3 can be. This chapter will also compare and contrast the industries and their usage of R/3.

Chapter four presents the motivation behind implementation of R/3 for all the companies and gives some examples of why each company was motivated by these advantages.

The final chapter presents conclusions on the motivation for implementation of R/3 and in which case each company's implementation should be used as a general model. The apparent challenges that are seen as universal during the conversion to R/3 will also be examined.

CHAPTER TWO

COMPANIES

Allergan Pharmaceuticals

Allergan Pharmaceuticals (Allergan) is a specialty pharmaceutical company based in Irvine California. Their primary mission is to discover and develop products for eye care, neuromodulator, and skin care. They are a technology driven company and hold the patent on Botox®. Allergan is focused on the high growth markets of acne and psoriasis in the US and Canada which is a very low competition market. Allergan is one of the leading skin care pharmaceutical companies in the world. They employ over 5,000 people worldwide with 4 R&D facilities and 3 state-of-the-art manufacturing plants. In 2002 Allergan was rated the #1 ophthalmologist sales force in the USA for the 4th year in a row. In 1995 they switched to R/3 from the older Client and Profits corporate planning system.

Clients and Profits provided Allergan with a low requirement system that provided the necessary tools for financial, client, vendor, and human resource management. It ran in Apple as well as Window based environments and was low maintenance and easy to use. However with Allegan

expanding rapidly they needed the global solution that R/3 provided. Top management determined that R/3 was much more flexible than their current ERP and that the different available preconfigured modules would simplify the amount of internal programming and minimizes system "tweaking". R/3 is used for all aspects in the company, from supply chain management, to human resources, to finance and accounting. The ability to combine all of the financial information for all of the operating areas of the company really simplified the process of creating the necessary financial reports for the stakeholders. Being able to produce these reports on demand at any time allowed upper management to better control the company and the direction it was heading.

Using R/3 at first was difficult due to the extensive amount of training that was required for all of the users, as well as the technical support personnel. R/3 was also a lot more demanding on IT resources, requiring more space, and greater hardware capability. Allergan utilized the fact that each user can be assigned a specific profile, a group, or set of profiles to restrict access to confidential information and to comply with necessary legal requirements such as the Sarbanes-Oxley act. In 2006

Allergan purchased another pharmaceutical/medical device company. This second company was not running R/3 but did have financial, customer, vendor and other important information in a SQL database. R/3 utilizes open source SQL queries to access information in its controlled databases. This meant that the new company database could be integrated into Allergan's existing R/3 implementation. Remote networking is not secure enough for Allergan so it was decided that the database would be moved from its' old location to Allergan headquarters in Irvine California. To do this, technicians rebuilt the databases' infrastructure at Allergan. This included using the exact same everything, processors, motherboards, operating system versions with the same level of updates. Once this was done the database was copied and brought to the new system. It was mirrored over and tested for integrity. If it failed they would still have the old one to fall back on and try again. Once it was over they tested it extensively and allowed R/3 to start working with it off line in a test environment. All of this was happening with the company still working and using both databases. After sufficient testing had been done it was brought live and completely integrated into the existing system. Allergan also did

more documentation of the implementation and upgrades that were done. They also wrote procedures on how additional modules would be written and added to the system.

Challenges of the implementation were not only the extensive training but also the cost of the necessary modules as well as converting all the information over from Clients and Profits. This took a lot of user time, and was checked 3 times before it was turned "Live". Allergan has benefited from R/3 in that they are now able to be flexible in their business and have new modules created if necessary to fit their business. Future features that users would like to see are a more simplified interface that made the many resources that are available more accessible and user friendly as well as a possible web based interface. Allergan is an excellent example of a company that has really thought through the implementation and System Development Life Cycle of R/3 with detailed information on the system for future users and administrators.

Pacific Communications

Pacific Communications is the largest advertising agency west of Chicago. They are a full service provider of healthcare communications and are the primary

advertising company for Allergan Pharmaceuticals as well as Inamed which has recently been acquired by Allergan. They specialize in market development, medical communications, branding, advertising, promotion and new product launches.

They have over 100 employees including artists, accountants, account coordinators, sales staff, and senior management. The company is divided into 2 areas, billable and operations. The billable area contains the artists, account coordinators and other staff that work on accounts directly and then bill the customer for their hours. The operations section includes accounting and finance as well as IT and administrative positions.

Before conversion over to R/3 Pacific Communications was using *Clients And Profits* business software. This piece of software offered a complete agency solution. It tied in the complicated quarter hour billings of the billable environment to the fix salary business side. It was not modular so there was no ability to easily modify it but it did not have the large overhead of larger ERP systems. It required a File Server, Web Server, and workstations. Clients and Profits realized that many graphic and media businesses used apple computers so

Clients and Profits was built to run on Power Mac's or Windows based machines.

Reasons for converting over to R/3 included the fact that their parent company was making the switch which forced Pacific Communications also to switch. This way the parent company's financial reporting was much easier. Pacific Communications also liked the flexibility of R/3 with the preconfigured modules available as well as custom designed modules that could be made. Another factor was that R/3 was designed to run in almost any software environment so there would not be problems with integrating onto the new Unix based OS X operating systems for their Apple machines used in production.

Upon implementation hurdles emerged that were overcome in various ways. The first major hurdle to overcome was the extensive training that was required for all personnel. Due to all of the resources that were now available to users it was very difficult to remember the transaction codes that a user really needed or the path to get to that transaction. To fix this access controls were placed on the system. User groups were formed that gave certain groups access to certain transactions. These transactions showed up in the users "Favorites" menu and allowed for

easier training on only the transactions a user could access. Another problem was the changing of the way artist recorded their time. R/3 is very capable of tracking labor time to job codes but with out a special module it lacks the invoicing required by Pacific Communications. At this time Pacific Communications is running a separate program to track billable hours and to do customer invoicing but it is planed to have a module made that will integrate this unique aspect of the billable environment. Another negative impact of the conversion to R/3 was the high cost incurred and all the time that went into modifying processes as well as modules to fit the company.

R/3 is currently being used for all aspects of the accounting and financial aspects as well as material management. Specific materials include printer/copier time, paper products used, ink used, and many other office/art supplies used for customer jobs. Not everything about the implementation was negative. Pacific Communications has benefited from R/3 through the ability to modify modules at a reasonable cost to more correctly fit the way they do business. Also it has simplified accounting and the amount of paper work that needed to be sent into the parent company. Being able to customize the

system has lead to a change in the way policy changes are made. Under the old system everything came from the top down due to various reasons such as changes in regulations or corporate directives. Now R/3 can be modified to meet these top down changes as well as bottom up process improvements. The old system did not allow for bottom up changes. Things were done how they were done because that was all the system allowed. Now significant cost savings have been achieved through changes that have been initiated from the bottom up.

In the future Pacific Communications will be looking for a more user friendly interface such as a web based one. Also due to the parent company implementing a lot of other modules that Pacific Communications did not need, they are overloaded with resources and would like to decrease them in the future.

Varian Incorporated

Varian Inc. is a manufacturer of scientific instruments and vacuum technologies. Their scientific instruments include High Pressure Liquid Chromatography, Gas Chromatography, Atomic Absorption, Nuclear Magnetic Resonance, Dissolutions, Mass Spectrometry, as well as a

consumables line for the above chromatography. The parent company, Varian, has been around for over 50 years and was one of the first companies to be involved in the production of information rich detectors and scientific instrumentation. From there through acquisitions they have become a global company with factories in Europe, Australia, and the USA, and have sales offices on every continent (except Antarctica).

Before the implementation of R/3, Varian used MANMAN and IBM AIX Mapix. Both of these programs were running on older hardware and the skill set necessary to maintain them was rapidly disappearing. Both of these programs ran in a 2-tier or Mainframe/terminal environment which made the security of data vulnerable to inexperienced users. The reason for moving to R/3 was to unify the company under one system. This improved financial reporting as well as gave more efficient communication of sales office needs to the correct manufacturing facility. There was also great concern about any Y2K glitches or bugs that would need to be fixed in the older legacy systems. The largest hurdle that Varian faced during the implementation was the training aspect. Due to all levels of employees inputting

data into the system it was very necessary that the training be extensive in order to prevent entry errors.

Varian primarily uses R/3 for accounting, sales, distribution, material management, and business analytics. Major benefits achieved from the use of R/3 are the business overviews for upper management which can be accessed at anytime from almost any location. Also the much improved interface between factories has led to quicker product order processing and increased speed in deliveries to customers. It also allows for inventory checks at all storage locations to find products in stock at one location that are need in another. This is especially important when products are made and stored in a factory in Europe and sold in the US.

The manufacturing in the US for the consumable products is done in Lake Forest, California. The production is split into three groups, automated Sample Preparation, manual Sample Preparation and HPLC. The reason for the split is due to the automated group not using product routing. Due to the automation being used it is not necessary to do a routing table and calculate the amount of time the product spends in each section of the machine. Also material goes from raw material to finished

goods so quickly that they do not do the multiple movements to different locations with the automation. The other two departments can take anywhere from two days to two weeks for raw material to be turned into finished goods. This is particularly important for cost accounting and computing work in progress and finished goods inventory all of which is done by R/3 through a calculation of amount of product at each stage of the production cycle. R/3 also allows for increased tracking of direct labor costs in the facility. Workers clock in to R/3 and enter the job code they are going to be working on and clock out when they are finished. This increase in efficiently tracking costs has led to decreased production costs and more accurate cost assignment for the accounting department.

Changes that many users would like to see at Varian are a friendlier user interface. Right now entry is done through a form like process. Also finding the correct transaction that will give you the results you want is difficult and the description of the transactions vague. Upgrading to the MySAP which includes a web based interface would likely improve the usability but is at a cost that is higher than Varian is currently willing to pay. Also the time and effort required to make new reports seems to be a

trouble spot as well with only a few key people able to data mine the information to give management the results they are looking for. Lastly processes are created from the top down due to regulation changes and changes in the corporate structure. Increased efficiency could possibly be achieved by allowing some bottom up changes to occur. These changes are usually better at affecting the bottom line of companies as they typically improve product cost through decreasing direct labor input. They are also inexpensive to develop due to employees who do the labor being the developers who know the job best and can find ways that logically will make their jobs easier.

Northrop-Grumman

Northrop-Grumman is a conglomeration of electronic and defense contractors dating back to as far as 1901 with TRW. Northrop Aircraft Incorporated was the parent company and has grown most recently through the following acquisitions. Grumman Corp(1994), Westinghouse Defense Electronics(1996), Logicon Corp (1997), Litton Industries(2001), Newport News Shipbuilding (2001), TRW Inc. (2002). Today Northrop Grumman is comprised of 8 strategic sectors in 4 units which amount to them being a 30 billion dollar global

defense and technology company to government and commercial customers around the world¹.

Before R/3, Northrop-Grumman was using Lawson's ERP system. The version of Lawson that they were using was designed for the medical profession and did not work well for them. This design was chosen because it offered a faster implementation, at a lower cost than competitor systems. Northrop-Grumman decided on R/3 for a 3 reasons. First the Lawson system was not designed for the industry that Northrop-Grumman has pursued as a Manufacturing and Information Technology company. Second the Lawson system was not known to be user friendly and training people to become qualified users on the system took a lot of time, sometimes months. Lastly they found that it was difficult getting *ad hoc* reports from Lawson that provided the data the way they, or their customers, wanted to see it. They believe that R/3 will solve these issues in that SAP designed R/3 to be modular and flexible in any industry. Through industry best practices designed for specific industries the system will be a better fit for Northrop-Grumman. R/3 is not as user friendly as other ERP systems on the market but there are a lot of consultant and trainers for using R/3 so training can be done in a more

organized way rather than by trial and error or "sit-a-longs" where employees sit and watch other employees work the system. Lastly R/3's flexibility will allow for the presentation of data in many ways depending on the customization options which will allow, if correctly set-up, Northrop-Grumman to do the *ad hoc* reports it and it's customer's desire.

Upon implementing R/3 the most difficult issue that was found was appropriately transitioning all existing employees, contracts, and information from the old system into the new system. This included making sure all the data was correctly entered. This may seem like a simple chore but a global company with data from over 100 years is a lot of information that had to be manually entered into the new system. This was mainly due to incompatibility issues with the way the Lawson system stored data. Once implemented R/3's primary uses will include, detailed accounting of financial projects, budgets, estimating, and invoicing. The system will also do job cost accounting, including contract tracking, PR generation, time card and travel expenses. The manufacturing module is not an area used by the group in San Diego but there are other divisions within Northrop-Grumman that will be using the

manufacturing module as well. Processes used by Northrop-Grumman are initially created from the top down due to the decision making process of the implementation of R/3. From here though Northrop-Grumman will use six-sigma to identify problems in processes and then fix them in a bottom up approach.

Northrop-Grumman hopes that since the data in R/3 will be more easily accessed by the user. They also perceive benefits from more accurate tracking of contracts and invoicing customers. Lastly they believe that R/3 will dramatically impact the *ad hoc* reporting by making it more detailed and accurate for managers, decision makers, customers, and suppliers. On the down side of the change over to R/3 is the problem associated with the running of two systems as once. As the company can not shut down for 2 months while the data is transferred and implementation occurs both the Lawson and SAP systems need to be running. They are experiencing problems such as timely deliveries to customers, employees not getting paid, and other difficulties associated with a new system. Due to using R/3 for Human resources everyone in the company needs to be trained on the new system and the new way of entering time card data. They hope that the negative impact will be

short lived and will fade away once all the "kinks" are worked out. In the future the users at Northrop-Grumman would like an improved user interface especially in the Human Resources area. This would decrease training of many of the people who use the system only for time card purposes. A web interface would also be nice as it will be easier to navigate and allow for enhanced remote manipulation specifically with entering of time card data remotely. Lastly, an intelligent system that tracks the transactions that a user uses in order to guess what transaction the person will use next. They believe this will increase the ease of use and increase efficiency.

Sempra Energy

Sempra Energy was created in 1998 by a merger of two long-established, and highly respected, investor-owned utilities with rich histories dating back more than 100 years. Sempra Energy was founded to capitalize on new opportunities in the competitive energy market. They are a Fortune 500 energy services company, based in San Diego, Calif., with over 29 million customers world wide. With 14,000 employees worldwide, the Sempra Energy companies develops energy infrastructure, operate utilities, and

provide related products and services to consumers in the United States, Europe, Canada, Mexico, South America and Asia. They serve the largest customer base of any energy utility in the United States through their Southern California utilities: San Diego Gas & Electric Co. and Southern California Gas Co. Their other businesses build and operate infrastructure, sell energy commodities and provide asset risk management, with expertise to bring them all together. These diversified assets and competencies are said to be the keystone of their success. Due to their size, scope, and resources they are a globally competitive organization. Sempra initiated the Implementation of R/3 approximately 6 years ago².

Before SAP R/3 Sempra used several custom built Mainframes with green screen applications with one application per mainframe. They had one system for accounting and finance, one for materials, and one for timekeeping. The primary goal of conversion to R/3 was to reduce the costs related to managing multiple systems and databases and unite these systems under one program. The costs of maintenance include the IT costs of maintenance, administrative costs for redundant data entry as well as other unseen costs. Another goal was to reduce errors

related to hand-on and paper handling tasks that would now be handled internally by R/3 through the integrated business modules. Also finding IT professionals who have the training and ability to maintain the aging systems as well as find parts for repairs is becoming an issue that needed to be addressed.

While implementing R/3 the major hurdle for Sempra was training people to use R/3's menu driven system while most people are familiar and more comfortable with a window or web based interface. It is thought of as non-intuitive and not user friendly and very difficult for people to master and navigate through the drop down system.

R/3 is going to be used for multiple aspects as is expected of an ERP system. It will be used to manage materials, Accounting and Financial tracking, and Human Resources. For materials it will integrate the ordering process into the accounting area for tighter control over costs. It will also better allocate expenses through out the company through increased control over where resources/materials are used and by whom. Accounting and Finance will be able to more quickly settle accounts at month and year end and be able to produce financial statements almost at will to give upper management a good

picture of the status of the company. Lastly employee hours will be tracked through the time clock module as well as employee history and position history be tracked through the Human Resource module. Explicit benefits seen have been tighter integration of systems which has lead to better data integrity. The data is now available more quickly and in a more useful format for decisions to be more quickly. Processes at Semptra are created in a bottom up way. People using the processes every day make suggestions for modifications and the suggestion moves up to the top to be implemented.

Some people at Semptra would like to see a better GUI such as that available in MySAP which anticipates common functions that people use more often. Perhaps even automatic creation of favorites based off of most commonly used transactions. Also a more robust help feature that not only tells what the error means but how to fix it with step by step instructions on what is the main cause. Lastly a more intuitive *ad hoc* reporting tool would be useful in reporting errors and problems people are having so that they can be fixed with patches and in subsequent releases of R/3.

Goodrich

Goodrich was founded in 1870 and was the first rubber company west of the Allegheny Mountains in Akron Ohio. BFGoodrich scientists are credited with the development of Poly Vinyl Chloride (PVC). In the 1940's they developed synthetic rubber which aided tremendously to the War effort. They are create the now industry standard tubeless tire. Other notable accomplishments include providing the tires of the Sprit of Saint Louis Flown by Charles as well as the space suits to protect America's first astronauts. In 1988 Goodrich exited the tire business by selling that division to MNA Inc. In the early and mid 1990's Goodrich made some strategic acquisitions and sold some divisions to bolster its presence in the Aircraft systems market. Now the Goodrich Corporation offers a range of products and services to engine manufactures such as GE, airlines such as Delta, and defense forces everywhere in the world. Particular products are their landing gear, engine control systems, sensors and safety systems. Their motto is that "What can you say about almost every aircraft flying today? We're on it."

Before R/3 was implemented Goodrich was using the Legacy PIOS (Production and Inventory Optimization System).

This system was used through out the aerospace industry as a MRP system. PIOS is also a modular system that requires no phase-in of specific modules. This system has proven difficult to implement in the industry due to extensive training requirements as well as acceptance by the employees. The system included many different modules similar to SAP's material Management and Production modules which allow for successful delivery of major system. Some benefits achieved through PIOS implementation are the singular material system used by multiple facilities, complete integration of the material processes, greater operating efficiencies, and cost reduction through the higher efficiencies of inventories. There were a variety of interfaces to the other systems: Finance, Spares Sales Order, Quality, EDI, Corrective Action Board etc. The main reasons for the conversion to R/3 seems to be due to the age of the components of the PIOS system as well as the complexity of the multiple Legacy system(s) inhibited the ability to modify them in support of movement towards Lean Manufacturing. PIOS operated on an IBM mainframe operating system similar to the way R/2 ran. This was old technology and had to be replaced due to the primary systems were 15-20 years old. At this age there was a lack of integration

which in order to mitigate required significant redundant data input and extensive manual effort to manipulate data for decision making. As less and less IBM mainframes exist the specialized IT skills required to maintain and enhance the Legacy systems were getting scarce due to market conditions such as an aging work force, retirements and IT industry focus on newer Web technology. Another reason for conversion was that the interfaces between multiple systems jeopardized data accuracy and there were worries about the reliability of the older system. This meant that replacement of legacy systems to a more robust, integrated solution was critical to the long-term growth of Goodrich.

Implementing R/3 was not easy and there were many hurdles to overcome. First was getting the work force to accept the new system as superior not just different. To do this an extensive training program was necessary, including training for some employees who were not exactly PC literate. The scope of the project itself was a challenge. Implementation needed to take place at 6 sites. One was in France, one was in Germany and the other 4 in the USA. To make it even more difficult there was no phases in or pilot program used. Everything was one day just switched at all the sites. This was to prevent

duplicating efforts and to enforce the acceptance of the system. Re-engineering of business processes prior to configuring SAP was also necessary to insure that poor or out dated business processes were not in the new R/3 system. Changes from the old processes, which were in place for decades, was painful and not well received with some departments in the organization. Lastly data cleansing prior to conversion and conversion of data from multiple systems into SAP was done to make sure that their R/3 system started with good data.

Goodrich uses the SAP R/3 Business Suite including Sales and Distribution, Supply Chain Management, ERP, Finance and Costing, Business Warehouse. Processes for the business are created in both a top down and bottom up manner. Top down changes occur for various reasons such as new corporate initiatives which drive specific business goals. Regulatory or compliance issues also require processes to change. Bottom up changes usually occur to improve efficiency. Goodrich has a definite bias for the action philosophy regarding the journey towards Lean Manufacturing which also drives process changes. This is usually a bottom up process as the workers who do the processes everyday are sometimes the best people to find

the improvements that make sense to create greater efficiency. From implementing R/3 Goodrich has gained the primary benefit of a robust integrated system which has eliminated redundant data entry and redundant interfaces between multiple systems. This came with a cost because R/3 requires more coordination between organizations and tasks. Not everyone wants their data to be presented in the same method and some organizations view the integration as a lack of control over their own processes. This rigid structure curbs creativity and can cause a decline in efficiency improvement due to people doing the same thing everyday the same way and not thinking about new ways to improve processes. Currently Goodrich has not exhausted the functionality of their current installation but do continue to modify the system to accommodate new business processes. They are in the conversion phase of the entire Goodrich Corporation which will result in 16 divisions in 80 facilities in 19 different countries with approximately 10,000 users when complete in 2012.

CHAPTER THREE

COMPARISON

After reading the preceding chapters a few universal challenges should be apparent. First is the lack of a user friendly interface of R/3 as found at Pacific Communications, as well as Northrop-Grumman, and Varian. Second lengthy training involved with implementation from Goodrich, Northrop-Grumman, Pacific Communications, Varian, and Allergan. Transfer of data from an older system to R/3 at Northrop-Grumman, Varian, and Sempra. Lastly system maintenance of the older mainframe systems at Varian, Sempra, and Goodrich. These four hurdles appear to be universal with the implementation of R/3.

The current data input and retrieval method user by R/3 is tabbed based and is very difficult to learn. Users must have not only an understanding of what R/3 is asking for but also know where to find the correct information. An example is from Varian when Sales people are looking for the tracking number of an order. The steps involved with finding this simple yet vital information include, finding and opening the sales order, displaying the document flow, displaying the shipping request, going to the menu and

requesting the shipment header. This is an extensive amount of work for users working remotely, and to remember this takes doing the process many times. This leads into the second issue of training.

R/3 is not a trainable program through reading or simple instruction. It takes experience and time on the system to learn and master working with R/3. By being tabular and using "hidden" headers SAP has not done customers favors when it comes to the easy of training on R/3. Some of the blame for this must be placed upon the customization and implementation teams in choosing what information needs to be inputted by users and how it is reported.

As the information collected by collected by companies has increased the usage of electronic databases has increased exponentially. As in any industry after time a industry leader appears, in computer software however this industry leader usually becomes a standard for all companies and the competition dies out. This is seen from the standardizing of databases on the SQL standard which is used by Oracle's Peoplesoft, MySAP, and R/3. The problem of transferring data from one system to another will be decreased in the future as everyone converts to a more

standardized data storage convention. This will alleviate the hurdle of data transfer experiences by Sempra, Northrop Grumman, and all other companies that had to manually transfer data. The new process will be similar to Allergan's merging of their acquisitions database into their own database.

Upgrading is an inevitability that all companies are going to face and in the future more often than previously. With Moore's law still in effect computers are operating faster and software being developed to utilize this speed. As such IT professionals are being taught about the present and the future not the past. This leads to a lack of trained personnel on older systems which is experienced at Sempra, and Northrop-Grumman.

All of these companies are in different industries, different businesses, and yet still have the same troubles with R/3. In the conclusion to this project I will outline some ideas that could help alleviate these challenges, and turn them into positive points.

CHAPTER FOUR

IMPLEMENTATION MOTIVATIONS

Operational Advantages

The following tables address the motivation behind implementing R/3 for each company. Table 1 lists operational advantages that were sought as outcomes. Each company analyzed had a different motivation and has been placed in these tables with the most import factor for each company in Bold text.

Table 1. Operational Advantage

	Systems Integration	Process Improvement	Supply Chain Management	Communication	Regulation/ Security
Allergan					X
Pacific Com.					X
Varian Inc	X	X	X	X	
Northrop- Grumman	X	X		X	X
Sempra	X				
Goodrich	X		X		X

Systems Integration

Systems integration was a motivator when companies were working on older systems or multiple data sets. This

is a motivator for business with information silo's or for companies who desire a centralized data set. Goodrich was using multiple hardware levels from mainframe to UNIX computers to run various software. The switch to R/3 was made to unify all the other software processes into one technology. Northrop-Grumman was working on older mainframe and green screen applications, system updating was not a large factor for the implementation but was a positive benefit from it through faster *ad hoc* reporting. Sempra, like Northrop-Grumman was running on a legacy system that did not allow for communication between operations and finance. Integrating these two departments allowed for better efficiency and quicker reporting. Lastly Varian was motivated by system integration in that it allowed for other key improvements such as communication and financial reporting which will be discussed later.

Process Improvement

Process Improvement, which also includes production improvements, is important for manufacturing companies in order to achieve better efficiency and product costing. Both Northrop-Grumman and Varian utilize the R/3 implementation for finding was to improve processes, and make sure that processes are being done correctly.

Northrop-Grumman specifically uses R/3 to track contracts and products to insure that the products are made correctly and according to exacting specifications.

Supply Chain Management

Supply chain management is another manufacturing company motivator in which integration with your supplier can decrease overhead and product lead times. Varian does this through the use of the MRP module of R/3, which has allowed for decreased lead times and lower overhead. Goodrich has improved its supply chain management though the better communication of resource needs internally and by restricting the views available to users greatly improved buying efficiency and delivery.

Communication

Communication is the motivation to have enhanced data transfer between factories, business units, or with in the organization as a whole. As companies globalize knowing where the product is or a customer becomes very important. This was a driving motivator for Varian who has factories all over the world producing products for other global locations. Being able to view inventory in other locations has been a key to improving service to customers for Varian. Also the internal communication between factories

that produce the same items has improved production efficiencies. Northrop-Grumman needed to improve the communication between their business systems, and quality assurance units in order to make sure customers were getting the quality product they purchased and that any quality problems were able to be quickly addressed.

Security / Regulation

The security/regulation motivator is a factor when a company or industry is heavily regulated by the government. Allergan and Pacific Communications implemented R/3 in order to meet reporting requirements for the FDA, as well as inventory and other business aspects as required by the NSA. Goodrich and Northrop-Grumman both do defense contracts, Northrop-Grumman exclusively. The R/3 system has user access controls and allows for roles to be assigned to people to limit their access to secured information. This was the driving operational motivation for Allergan, Pacific Communications, and Northrop-Grumman.

Relationship Advantages

R/3 is also used to improve the relationships established by a company with the various outside customers and suppliers as well as internal business units that use

the system. This is done through the creation of a master data set of all your customers and suppliers.

Table 2. Relationship Advantages

	Customer	Supplier	Business Units
Allergan	X		X
Pacific Com.			X
Varian Inc			X
Northrop-Grumman	X		X
Sempra	X		
Goodrich		X	

Customer Relationship

By using SAP's CRM module the activities of all your customers can be tracked, evaluated, and integrated into the business. Allergan sales people use this to track customer sales to find out when they typically order and make sure that stock is available. The CRM also allows them to see what the customer has ordered in the past and gives them an idea what they might be interested in the future. Sempra similarly was motivated by providing better service to their customer. By tracking what the customer has in the way of equipment Sempra can better troubleshoot technical problems and make sure repair technicians have the right parts when they go out to do a repair. Northrop-

Grumman also was motivated by an improved relationship with their customer. They achieved this through R/3's contract tracking, and quality assurance reporting. By having better understanding of the customers needs and quickly solving any quality problems customers are more satisfied with Northrop-Grumman's products and services.

Supplier Relationship

By integrating your supplier into your system you can better manage your orders and decrease you dependency on other suppliers. This is a benefit due to contractual delivery services that can be established as well as the service a large company like Goodrich receives when they give a big portion of their business to one supplier. Goodrich has used R/3 to include their suppliers in the production planning stages so that the supplier is more prepared for orders and delivery when the parts are needed. This has the effect of decreasing production lead times due to waiting for product to arrive. This also creates the ability to get a larger discount for the single supplier doing more business then might be achieved through price shopping. By not having to shop for the best price, the quality received can be relied on to be the same part to part, batch to batch, or lot to lot.

Business Unit Relationships

Establishing good working relationships between business units is very important in order to achieve the synergy needed in today's competitive business world. The unique modularity that R/3 has that allows for seamless documents to flow from department to department has made life easier for many people. With out R/3 a typical sales order has to be processed and sent to accounting. From there, if there are no holds it goes to shipping where an invoice is printed and shipped with the product. Once shipping has shipped the product they tell accounting and they send a bill. R/3 eliminates all of the back and forth between departments and allows them to interact less frequently enabling them to do their jobs more efficiently. A sales order in R/3 is checked by the system for holds then a delivery note is printed for shipping, and then when shipped the system alerts accounting to send a bill. The R/3 system also improved the financial reporting ability of the company and due to that being done automatically and on a continuous basis, there is less waiting and complaining about the speed of which on unit might work in comparison to another.

Market Advantages

Table 3. Market Advantages

Market Conditions	Competition	Customer Demands	Costs Savings	Financial Reporting
Allergan				X
Pacific Com.				X
Varian Inc	X			
Northrop-Grumman		X		X
Sempra		X		
Goodrich			X	

Competition

This motivation occurs when the competition is globalized and integrated. Part of the motivation for Varian to implement R/3 was to keep up with competition and eliminate the competitive advantage an integrated system provided for their competitors. This motivation could also be a proactive measure for a company to implement before their competition to achieve a strategic advantage. However this was not the case with any of the companies interviewed.

Customer Demands

This motivator is caused by customer expectations. When customers want to integrate you into their supply chain having your outputs standardized is necessary. Many

times people view a company as the center of a supply chain model, but it could also be the customer or supplier in another company supply chain model. This motivation also occurs when customer's needs are urgent. This is the case with Semptra utilities where their product is natural gas or electric which many people in today's society can not live without. Northrop-Grumman on the other hand has stringent contractual customer demands that required software tacking which R/3 was capable of.

Cost Savings

This is the motivation of saving money through other operational or market advantages. This includes process improvement and the increased efficiency in product production. By centralizing information less duplication is created and costs kept low. Goodrich was motivated by this in allowing for better control of consignment inventory. By stocking parts in customer facilities it saved them the overhead cost and provided the customer with an easier alternative than fixing the broken part when a new one was readily available.

Financial Reporting

This is the motivation of combining the financial information from multiple divisions into a single set of

financial statements. This was a primary motivation for Allergan pharmaceuticals as well as Pacific Communications. Each business unit/company that was under the Allergan umbrella used different financial reporting software. The change over to R/3 allowed Allergan and Pacific Communications. to more easily create the balance sheets and income statements for SEC and investor reporting. Being able to do this quickly and efficiently was a deciding factor when choosing to implement R/3.

Customization

While each company purchased the same software package, each modified the software to better suite their motivation and business processes.

Allergan Pharmaceuticals

Allergan Pharmaceuticals implemented not only the core modules but also the CRM module to better manage their customer information. They also employed many other proprietary customized modules. One example is the module that transfers the data from an older system that is still in use into the financial module in R/3.

Pacific Communications

Pacific Communications did a minimal implementation due to being forced by their parent company. They implemented only the financial, accounting, and material management modules. Being an advertising firm most of their product is not physical however they modified their implementation to be integrated with the IT system, specifically the printers, to account for material usage. This allowed for better costing to each project and the actual material used.

Varian Incorporated

Varian Inc. implemented a global implementation of R/3 to tie together multiple factories, multiple business units and multiple sales forces. They did not implement the CRM, and only recently implemented the Business Warehouse module. The difference in their implementation is specifically the reports that are produced. The sales reports are segmented into the business units and then broken down to territories through the use of zip codes (in the U.S) and other ways in other parts of the world. Another customized piece is the way they assign discounts to customers. They customized part of the Sales and Distribution module to be able to give specific discounts

to each customer. Specifically they utilize product hierarchy to determine what products a customer receives a discount on.

Northrop-Grumman

Northrop-Grumman was motivated strongly through contract tracking and creation. In order to better accomplish this goal they customized their implementation to allow for the tracking of stages of processes that are taking place on a project. They also implemented the HR module in order to track production costs and have better cost accounting. They also customized their security module to give enhanced protection to internal and external entrances. This was done to protect classified information from unauthorized users. With all the government projects and classified information the external connections to they system were greatly protected with customized coding for user verification and password strength.

Sempra Utilities

Sempra's implementation was customized with an interactive map of company resources. Being a supplier of natural gas, most of the infrastructure is underground. Through the use of the integrated mapping tool they can click on a customer location or any other piece of

infrastructure and get detailed information on what is at that location from R/3. This is a major factor in improving customer service by allowing the tech support people to know exactly what equipment will be needed to fix a problem and where it is via GPS locating. This was a very unique customization piece that is very useful for other utility companies to look into when placing infrastructure.

Goodrich

Goodrich customized their implementation by segmenting the views that each user role could see. Instead of giving everyone complete visibility of all products they limit the visibility of users to parts that they will use. They also implemented the system in the aerostructure division and used it for a model for implementation in the other divisions. They are finding that the system needs to be customized even further when bringing it to a new division due to differences in product make-up and processes. More customization occurred with the support of the system being centralized for the entire company rather than being supported at the divisional level. This could cause trouble in the future due to the differences in the system between divisions.

CHAPTER FIVE

CONCLUSION

Model Usage

Allergan Pharmaceuticals

The Allergan implementation was motivated by regulation, security, customer relations, business unit relations and financial reporting needs. They should be modeled when a company has stringent security and regulation requirements such as FDA or NSA type reporting and process control. The company should also be a supplier to a large number of customers and have multiple business units that sell non-synergistic products. Lastly the company modeling Allergan's implementation should have need for fast reporting and consolidation of financial reports for decision making and investor relations.

Pacific Communications

The motivation for Pacific Communications was specifically done due to requirements of its parent company. This implementation should be modeled by companies who do not need a majority of the modules and only need to be able to do financial reporting to a parent company. An example of this might be any service

organization (Marketing firm, Law firm etc.) that is a subsidiary of a larger organization.

Varian Incorporated

Varian was motivated by system integration, process improvement, supply chain management, improved communications, improving business unit relations and keeping up with the competition. Varian is a good model for a struggling global manufacturing organization that is in a reactive mode to their environment. The company should be using older systems that are not integrated and have facilities world-wide that are not able to effectively communicate with one another. The company should have experience with MRP and require bidirectional communication between factories to efficiently produce products for sales organizations around the world. Lastly Varian's strategy should not be used by a market leading company.

Northrop-Grumman

Northrop-Grumman was also motivated by many factors as described in the previous chapter. This model is typical of a government contract company that has high security requirements for top secret accounts. They should have a large number of suppliers and limited customer base. The focus should be on system integration and better

communication between business units to improve product quality and decrease the product development time due to components coming from multiple business units and locations. This is an excellent model for a large complex manufacturing company that works with supply parts in the millions and finished products in the hundreds. This is also a good model for contractual companies that have long standing contracts that have periodic date deadlines that must be met. Lastly the company should also have financial and governmental reporting requirements that must be combined from multiple business units.

Sempra Utilities

Sempra's motivation for implementation was system integration and customer satisfaction. Being a utility company the customers expect your service to be available at their location at all times. Sempra utilizes inventory tracking and customer information storage to make sure that repairs can be done quickly and minimal loss of service is experienced. The Sempra model is ideal for other utility companies such as telephone, Internet, gas, electricity and can be applied to local city level governments as well. It is ideal for companies with minimal or no suppliers with a large customer base with limited or no ability to choose

their provider. It provides for better service to the customers, decreased interruptions in service, which in return gives more profits.

Goodrich

Goodrich was motivated to implement R/3 due to the need to integrate aging systems, improve their supply chain and supplier relations, save money by decreasing costs and make regulatory reporting easier and more efficient. Their model should be done used by manufacturing companies who work with a small number of customers both industrial and governmental. They should have older systems that are old and cost a lot in yearly maintenance. This model is for companies wanting to improve supplier relations and integrate the supplier into the supply chain to improve efficiency and decrease overhead in a move towards Just-In-Time manufacturing. The company should also have repair contracts, and a full service repair facility. R/3 allows Goodrich to track part usage and have a detail maintenance schedule created for it's customers under contract. This model is similar to the model used by Varian but differs in the integration of business units and the variance in requirements from unit to unit.

Common Challenges

During customization of R/3 the fields required to be filled in for each transaction is selected. For example in setting up a new material you can set the movement device, such as hand cart or forklift, which is required to move the product. This could be required or not depending on the implementation requirements and decisions done before the implementation. However there is no way to hide this input if it is not required. This lack of hiding non required inputs gives added strain to users when doing a transaction. The strain is caused by having to remember which fields need to be filled in and which ones do not. If the field is not required, then it should not show up unless data is defaulted into it. This would greatly simplify the most common training of users which is the Sales and Distribution field. The people taking orders have many fields that are not "required" but are still there. Hiding these fields would greatly simplify their jobs and making training easier due to only explaining the necessary items, and those items being the only ones seen. Further on this suggestion would be an "Advanced" mode which can be turned on and show all options for the transaction. A separate mode would be created for the use

of new people just out of training. This would allow employees to be active on the system and be working sooner and allow for advanced training of necessary personnel.

The above suggestion does touch upon another key hurdle, and that is training. Besides a multi-mode set-up I would also recommend that an extensive knowledge base be created for each implementation. This knowledge base could be searchable by all users of the system and provide answers to almost any question. Goodrich is doing a system like this but they are providing a living knowledge base. Meaning they are using live support for inquiries of the system. By creating a knowledge base for the system and training users how to use the search function instead of training users on transactions they might use in the future they can look up their question when they are faced with it. Hands on training and making a connection with the transaction will "stick" much better than a demonstration or lecture on the subject.

From Michael Porter's five forces barriers to entry into the market is an important force that all companies should try to increase with a strategic information system. However with standardizing of database formats occurring this force is being decreased for ERP vendors as the

conversion cost for clients decrease. However with the industry trend moving towards open source SQL this does not mean that all customers will jump to the newest cheapest company that produces some software. This is seen primarily with the Linux operating system. There are companies out there that use Linux over Microsoft Windows but they are few and far between.

In addressing the last common issue that was apparent is the fact that upgrading from older systems cost a lot of money and was necessary due to lack of necessary support. There is no good way to deal with this issue other than inside training and excellent employee retention. It is vital for a company that has older IT architecture and systems that they maintain the employees who know how to upkeep it. However the lack of skilled people in the work force who have the knowledge to work on legacy and mainframe systems is also a market driver. It can force a company to upgrade to newer, and hopefully better, systems.

A final issue that has been made apparent through this paper is that fact that all the companies customized their implementation to meet their specific needs. I believe that even if an analysis was done on companies in the same industries, each would be different. These differences

would come from differences in processes, different core values, different strengths, and different weaknesses. R/3 acts more as a framework or skeleton upon which a company can put in other pieces as needed and it is this configurability that has made R/3 so popular.

R/3 is an all inclusive program which can create and process all the transactions and reports a company could want. It needs a lot of input and forethought before jumping into implementation. Analysis of all the processes a company does, how they do it, and how they should do it must be done. Also due to the flexibility of R/3 companies can modify processes to their own detriment. This is seen in an example from Varian where they changed a stocking location but orders that were scheduled to ship from the old location were not changed to ship from the new location. This caused orders to be lost in the system and not shipped to until sales reps found the sales and notified customer service.

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